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## (54) INK JET RECORDING PAPER

### (57)Abstract:

PURPOSE: To provide ink jet recording paper imparting high ink density and not having a coating defect such as the crater trouble caused by the foaming of an ink receiving layer.

CONSTITUTION: Two or more ink receiving layers each containing at least synthetic non-crystalline silica and an aq. binder are provided on a support and the number average particle size of synthetic non-crystalline silica contained in the uppermost ink receiving layer is 6-15 $\mu$ m and that of synthetic non-crystalline silica contained in the ink receiving layer other than the uppermost layer is 1-5 $\mu$ m. It is pref. to form the ink receiving layers, especially, the uppermost ink receiving layer by a curtain coater.

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**CLAIMS**

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[Claim(s)]

[Claim 1] The ink-jet record form characterized by for the number-average particle diameter of the synthetic amorphous silica which contains the ink acceptance layer which contains a synthetic amorphous silica and an aquosity binder at least in the best layer of the aforementioned ink acceptance layer in the ink-jet record form prepared more than two-layer on a base material being 6-15 micrometers, and the number-average particle diameter of the synthetic amorphous silica contained in ink acceptance layers other than the aforementioned best layer being 1-5 micrometers.

[Claim 2] The ink-jet record form according to claim 1 characterized by forming the ink acceptance layer of the aforementioned best layer by the curtain coating machine.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

**[0001]**

**[Field of the Invention]** About an ink-jet record form, especially this invention has the high concentration of the recorded picture image or a character, and relates to the ink-jet record form without occurrence of application faults, such as crater failure by the foaming in an ink acceptance layer.

**[0002]** Multiple-color-izing is easy for the ink-jet recording method, and record of the size version also has the advantage of a possible grade the top where the record speed is comparatively high-speed. On the other hand, about the blinding of the nozzle which had become the problem from the former, and the maintenance, enhancement is progressing from both sides of ink and equipment, and in various fields, such as various kinds of printers, facsimile, and a computer terminal, it is used widely and has spread quickly now.

**[0003]** The ink which the thing of an aquosity [ ink ] is used from safety and the sanitation side, and adhered to the ink-jet record form usually needs to be absorbed quickly by the ink-jet recording method. That is, in the case of the color ink-jet process using two or more ink nozzles, in the form side, the ink drop injected previously is absorbed by the need before injecting the following ink drop, and it is required from this point that an ink-jet record form has the high absorptivity of an ink drop.

**[0004]** However, in order to acquire the clear picture image with high concentration, the color coupler in ink is stopped on the front face of an ink-jet record form, and to make only vehicles, such as water and a solvent, permeate into a form is desired. A base material is carried out, although the paper which adjusted the umbrella height, the air permeability, the degree of size, etc. is also used, there is a dislike which becomes irregular [ such papers / how on the space of an ink drop to spread ], and spreads too much in many cases, and, for this reason, the resolution of a picture image declines, and it is easy to produce concentration nonuniformity from such a viewpoint.

**[0005]** Moreover, simultaneously, for the front face to have smooth nature and to be hard for concentration to be high, and for an ink acceptance layer to have high resolution, and to exfoliate in a friction etc. is desired from fields, such as the endurance of an ink-jet record form.

**[0006]** The purpose of this invention has high picture image concentration, and the application side of an ink acceptance layer is to offer the ink-jet record form which has smooth nature and has the ink acceptance layer which does not exfoliate easily by friction etc.

**[0007]** The purpose which this invention described above is 6-15 micrometers in the number-average particle diameter of the synthetic amorphous silica which contains the ink acceptance layer which contains a synthetic amorphous silica and aquosity binding at least in the best layer of the aforementioned ink acceptance layer in the ink-jet record form prepared more than two-layer on a base material, and was attained by the ink-jet record form whose number-average particle diameter of the synthetic amorphous silica contained in ink acceptance layers other than the aforementioned best layer is 1-5 micrometers.

**[0008]** Although all of the water silicic acid obtained by the silicic anhydride obtained by the dry

process and the wet process of the synthetic amorphous silica used by this invention are usable, it is desirable to use especially water silicic acid.

[0009] The ink-jet record form of this invention prepares an ink acceptance layer more than two-layer at least on a base material. The synthetic amorphous silica contained in the best layer among the ink acceptance layers more than two-layer [ these ] requires that a number-average particle diameter should be 6-15 micrometers. In the synthetic amorphous silica contained in the ink acceptance layer of the best layer, a number-average particle diameter spreads [ from the point of print concentration / the diameter of \*\*\*\*\* ] and has the desirable larger one. However, if the number-average particle diameter of the synthetic amorphous silica contained in the ink acceptance layer of the best layer exceeds 15 micrometers, the smooth nature of the front face of an ink-jet record form falls, and the so-called \*\*\*\*\* generates and is not desirable. Moreover, the number-average particle diameter of the synthetic amorphous silica contained in the ink acceptance layer of the best layer becomes [ the parvus and print concentration ] low and is not more desirable than 5 micrometers.

[0010] Moreover, the number-average particle diameter of the synthetic amorphous silica contained in ink acceptance layers other than the best layer needs to be 1-5 micrometers. If the number-average particle diameter of a synthetic amorphous silica exceeds 5 micrometers, application faults, such as crater failure by the foaming in an ink acceptance layer, arise, and, on the other hand, a number-average particle diameter becomes [ the parvus and print concentration ] low and is not more desirable than 1 micrometer.

[0011] For a synthetic amorphous silica, specific surface area is 100g/m<sup>2</sup>. The above is desirable and it is 200g/m<sup>2</sup> more preferably. It is above and 0.5ml /or more is [ g ] 1.0ml/g or more more preferably as pore volume. Specific surface area is 100g/m<sup>2</sup>. It becomes it is small and more enough [ in 0.5ml // the parvus and absorption of an ink drop ] as pore volume than g and is not desirable.

[0012] In an ink acceptance layer, an aquosity binder contains with the synthetic amorphous silica described above at least. As an aquosity binder, water dispersibility macromolecules, such as water soluble polymers, such as polyvinyl alcohol, silanol denaturation polyvinyl alcohol, starch, cation-ized \*\*\*\*\* , casein, gelatin, a carboxymethyl cellulose, a hydroxyethyl cellulose, and a polyvinyl pyrrolidone, a styrene butadiene latex, and an acrylic emulsion, etc. are mentioned. these aquosity binders are independent -- or two or more sorts can be used together and it can use Especially in this invention, polyvinyl alcohol and silanol denaturation polyvinyl alcohol are suitable also of these in respect of the adherability and the peeling resistance of an ink acceptance layer to a pigment.

[0013] An ink acceptance layer can contain white pigments other than a synthetic amorphous silica or the deck-watertight-luminaire-ized agent, the light-fast improver, the surfactant, and the other additives other than a synthetic amorphous silica and an aquosity binder if needed.

[0014] As a white pigment, a calcium carbonate, a kaolin, talc, clay, diatomaceous earth, a magnesium silicate, a calcium silicate, an alumina, a zeolite, a barium sulfate, a urea-resin, melamine resin, etc. are mentioned. As a white pigment, this invention may use the above-mentioned synthetic amorphous-silica independent, and can use it together with this synthetic amorphous silica, and can also use other white pigments.

[0015] In this invention, when using only a synthetic amorphous silica also independently as a white pigment, the loadings of the synthetic amorphous silica used for the best layer of an ink acceptance layer When 30 - 60 % of the weight is desirable and uses other white pigments with a synthetic amorphous silica as a white pigment to the solid content of the best layer, The amount of the whole white pigment in the solid content of the best layer has 40 - 80 desirable % of the weight, and the loadings of a synthetic amorphous silica have 70 desirable % of the weight or more among white pigments.

[0016] Moreover, when using only a synthetic amorphous silica also independently as a white pigment in the case of ink acceptance layers other than the best layer The synthetic amorphous-silica loadings blended with ink acceptance layers other than the best layer 40 - 70 % of the weight is desirable to the solid content of ink acceptance layers other than the best layer. When using other white pigments with

a synthetic amorphous silica as a white pigment, the amount of the whole white pigment in the solid content of ink acceptance layers other than the best layer has 50 - 90 desirable % of the weight, and the loadings of a synthetic amorphous silica have 70 desirable % of the weight or more among white pigments.

[0017] The deck-watertight-luminaire-ized agent is effective in deck-watertight-luminaire-izing of a picture image, and its cation resin is desirable especially as these deck-watertight-luminaire-ized agents. As such a cation resin, polyamide polyamine epichlorohydrin, polyethyleneimine, a polyamine sulfone, a dimethyl diaryl ammoniumchloride polymerization object, a cation polyacrylamide, colloidal silica, etc. are mentioned, and polyamide polyamine epichlorohydrin is suitable especially of these cation resins. The content of these cation resins has 1 - 15 desirable % of the weight to the total solid of an ink acceptance layer, and it is especially desirable that it is 3 - 10 % of the weight.

[0018] As a light-fast improver, the ultraviolet ray absorbent of benzotriazol systems, such as a zinc sulfate, a zinc oxide, a \*\*\*\*\* amine system antioxidant, and a benzophenone, etc. is mentioned. As a surfactant, amphoteric surface active agents, such as anion system surfactants, such as a carboxylate, a sulfonate, a sulfate salt, and phosphate, an ether type, an ether ester type Nonion system surfactant, a betaine, aminocarboxylate, and an imidazoline derivative, etc. are mentioned, and the zinc sulfate is still suitable especially of these.

[0019] As an additive added by other ink acceptance layers, a pigment agent, a thickener, a defoaming agent, a color, a fluorescent brightener, antiseptics, pH regulator, etc. are mentioned.

[0020] As a means to apply the application liquid for forming the above ink acceptance layers on a base material, although a curtain coating machine, a roll coater, a reverse roll coater, an air knife coater, a blade coating machine, a spray coater, etc. are mentioned, especially in this invention, a curtain coating machine is desirable. In a curtain coating machine, there is an advantage which is excellent in the smooth nature of an ink acceptance layer front face.

[0021] although an ink acceptance layer is prepared more than two-layer at least in this invention -- the amount of whole ink acceptance layer coatings -- 5-100 micrometers -- desirable -- 10-70 micrometers -- it is -- a coverage -- a solid content -- 5-50g/m<sup>2</sup> -- desirable -- 10-35g/m<sup>2</sup> it is . among these, the amount of coatings of the best layer -- 2-50 micrometers -- desirable -- 5-25 micrometers and a coverage -- a solid content -- 2-30g/m<sup>2</sup> -- desirable -- 5-15g/m<sup>2</sup> it is -- the thickness of ink acceptance layers other than the best layer -- 2-60 micrometers -- desirable -- 5-35 micrometers and a coverage -- a solid content -- 2-40g/m<sup>2</sup> -- desirable -- 5-25g/m<sup>2</sup> it is .

[0022] As a base material used for this invention, you may be any of the paper which consists of usual natural pulp, and natural pulp / synthetic pulp, a synthetic paper, and a plastics film sheet, and it is the thickness of 10-250 micrometers of a base material, the basis weights 10-250g/m<sup>2</sup>. It is desirable.

[0023]

[Example] Hereafter, this invention is not limited by this although an example explains this invention. Beating of the wood pulp which consists of the examples 1-5 and example [ of a comparison ] 1, - 5 <production of stencil paper> LBKP90 weight section and the NBKP weight 10 section was carried out using disk \*\*\*\*\* , and the pulp slurry of 370ml of Canadian freeness was obtained. The talc 8 weight section, the rosin 0.7 weight section, and the aluminum-sulfate 1 weight section are added to the pulp 100 weight section, stirring the obtained pulp slurry, and it is 80g of basis weights/, and m<sup>2</sup> by the Fortlinear paper machine. Paper making of the stencil paper was carried out. It is an oxidized starch at a solid content by surface size press at the time of paper making 1.5g/m<sup>2</sup> It was made to adhere and considered as the stencil paper for an application.

[0024]

<Adjustment of the application liquid for lower layers> A synthetic amorphous silica given in Table 1 100 weight section The polyvinyl alcohol of polymerization degree 1500 70 weight section A zinc sulfate 2 weight section Sulfo \*\*\*\*\* 4 methyl pentyl ester 1.5 weight section Sulfo \*\*\*\*\* 2 ethylhexyl ester 1 weight section Water was added and the above-mentioned constituent was used as application liquid of 15 % of the weight of solid contents. It is this application liquid on a base material

at a curtain coating machine 15g/m<sup>2</sup> It applied.

[0025]

<Adjustment of the application liquid for the best layers> A synthetic amorphous silica given in Table 1 100 weight section The silanol denaturation of polymerization degree 1100 Polyvinyl alcohol 40 weight section Polyamide polyamine epichlorohydrin 60 weight section zinc sulfate 10 weight section Sulfo \*\*\*\*\* 4 methyl pentyl ester 1.5 weight section Water was added and the above-mentioned constituent was used as application liquid of 20 % of the weight of solid contents. It is 8g/m<sup>2</sup> on the lower layer obtained above by the curtain coating machine in this application liquid. It applied.

[0026] The number-average particle diameter and oil absorbency of a synthetic amorphous silica which were used in the example and the example of a comparison are shown in Table 1.

[0027]

[Table 1]

	下層		最上層	
	粒径 ( $\mu\text{m}$ )	吸油度 (ml/100 g)	粒径 ( $\mu\text{m}$ )	吸油度 (ml/100g)
実施例 1	3	230	8	220
" 2	3	230	12	205
" 3	2	240	8	220
" 4	3	230	6	220
" 5	4.5	230	8	220
比較例 1	8	220	8	220
" 2	12	205	12	205
" 3	3	230	2	240
" 4	3	230	18	180
" 5	0.5	240	3	230

[0028] Next, the picture image concentration and the appearance of an ink-jet record form which were acquired were evaluated. The evaluation technique is shown below.

[0029] The print of the <evaluation technique> (1) picture-image concentration water color ink (Magenta) was carried out by \*\*\*\*\* presentation printer Kaleida (tradename of Fuji Photo Film, Inc.), and picture image concentration was measured by the Macbeth concentration meter.

[0030] (2) Viewing estimated the field status on the front face of an application of an appearance evaluation ink acceptance layer (\*\*\*\*\* on the front face of an application, feeling of a feel).

[0031] [0032] which shows an evaluation result in Table 2

[Table 2]

	画像濃度	外観
実施例 1	1.71	良好
" 2	1.73	良好
" 3	1.70	良好
" 4	1.65	良好
" 5	1.75	良好
比較例 1	1.72	クレーター故障発生



" 2	1. 6 9	クレーター故障発生
" 3	1. 5 6	良 好
" 4	1. 7 1	表面ザラツキ
" 5	1. 4 8	良 好

[0033] As for picture image concentration, it is desirable practically that there are 1.60 or more, and in the ink-jet record form of the example 1 - the example 4, although picture image concentration all shows 1.60 or more values, the example 3 of a comparison and the example 5 of a comparison are 1.60 or less picture image concentration, and are insufficient of picture image concentration.

[0034] For the example 1 - the example 5, the field status on the front face of an application is status \*\*\*\*\* to which the crater failure by foaming generates convenient example 1 of a comparison and example 2 of a comparison after the best layer application by picture image concentration, and an application front face can tend to take a front face by friction in the state of \*\*\*\*\* in the example 5 of a comparison which is convenient by picture image concentration although each is good.

[0035]

[Effect of the Invention] As mentioned above, according to the ink-jet record form of this invention, the concentration of a record picture image is high, and moreover there is no occurrence of the crater failure by the foaming in an ink acceptance layer, and \*\*\*\*\* does not occur on an application front face, and the front face of an ink acceptance layer does not break away by friction.

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[Translation done.]